BULLETIN

OF THE INSTITUTE OF METALS

VOLUME 3 JUNE 1957 PART 22

INSTITUTE NEWS

Joint Spring Meeting

The Joint Spring Meeting with the Associazione Italiana di Metallurgia, Association Suisse pour l'Essai des Matériaux, and Société Suisse des Constructeurs de Machines took place successfully in London from 29 April to 3 May, with visits to provincial centres for the foreign participants from 5 to 8 May.

Representative groups of members of the guest societies were present, including the President of the Associazione Italiana di Metallurgia (Dott. A. Daccò) and the President of the Association Suisse pour l'Essai des Matériaux (Professor Dr. A. von Zeerleder). The meeting was very well attended, over a thousand persons having registered to take part in one or more of the activities on the programme.

The Council attaches much importance to joint meetings of this kind, for they afford an opportunity not only of returning hospitality enjoyed by members of the Institute abroad, but also for metallurgists from a number of different countries to meet and exchange ideas.

The Italian and Swiss Societies

The Associazione Italiana di Metallurgia, which is concerned with both ferrous and non-ferrous metallurgy, was founded in Milan early in 1946. It has now over 1700 members and publishes monthly *La Metallurgia Italiana* and *La Fonderia Italiana*.

The Société Suisse des Constructeurs de Machines, when first formed in 1883, was concerned only with economic matters, but now its activities are also technical in character. Membership is open to machinery-manufacturing firms only and not to individuals. The Société is associated with the journal *Swiss Technics*.

The Association Suisse pour l'Essai des Matériaux was founded in 1926 and now has a membership of over 600. Its work relates to research in the field of testing materials, both metallic and non-metallic, and to the standardization of testing procedures. Its official organ is *Schweizer Archiv für angewandte Wissenschaft und Technik*.

Corresponding Member to the Council

Dr. D. P. Antia has been elected by the Council to be a Corresponding Member to the Council for India in succession to the late Mr. G. C. Mitter.

Committees for 1957–58

The following Chairmen of Committees have been appointed by the Council for 1957–58:

Finance and General Purposes Committee: Mr. R. D. Hamer.
House Committee: Dr. Maurice Cook.
Library Committee: Dr. J. C. Chaston.
Local Sections Committee: Dr. H. M. Finniston.
Metal Physics Committee: Professor H. O'Neill.
Metallurgical Engineering Committee: Professor H. Ford.
"*Metallurgical Reviews*" *Committee:* Dr. Ivor Jenkins.
Nuclear Energy Committee: Mr. G. L. Bailey.
Publication Committee: Dr. H. M. Finniston.

Election of Members

The following 4 Overseas Sustaining Members, 35 Ordinary Members, 2 Junior Members, and 11 Student Members were elected on 26 April 1957:

As Overseas Sustaining Members

American Brass Company, The, Waterbury 20, Conn., U.S.A.

American Metal Company, Ltd., The, 61 Broadway, New York 6, N.Y., U.S.A.

Commissariat à L'Energie Atomique, 69 rue de Varenne, Paris (7e), France.

Société Cuivre et Alliages, 11 rue Godefroy Cavaignac, Paris (11e), France.

As Ordinary Members

Amundsen, Vibeke, M.A., Direktor, Danmarks Tekniske Bibliotek, Øster Voldgade 10, København K, Denmark.

Bairiot, Joseph Victor, Ing.civ.Mines, Manager, Centre d'Information du Nickel, 28 rue des Colonies, Bruxelles, Belgium.

Beasley, Wayne Machon, S.B., Member, Research and Development Group, Nuclear Products Division, Metals and Controls Corp., Attleboro, Mass., U.S.A.

Blackburn, Robert Harold, M.A., B.L.S., M.S., Chief Librarian, University of Toronto, Toronto 5, Ont., Canada.

Cormack, William J., B.Sc., A.R.T.C., Caterpillar Tractor Co., Ltd., Tannochside, Uddingston, Lanarkshire.

Douzinas, Nicolas, E. M., M.I.N.A., M.I.Mar.E., Technical Director, Niarchos (London), Ltd., 41–43 Park Street, London, W.1.

DRUYVESTEYN, *Professor* M. J., Professor of Metal Physics, Laboratorium voor Technische Physica, Technische Hogeschool te Delft, Mijnbouwplein 11, Delft, Netherlands.

ERDÖS, Ernst Gyula, Cand.ing.chem., Chef des chemischen und spektrographischen Laboratoriums, Aktiengesellschaft der von Moos'schen Eisenwerke, Emmenbrücke, Switzerland.

EUDIER, Michel Alexandre Jean, Ing.Doct., Administrateur-Directeur Technique, La Métallurgie des Poudres, Beauchamp (S.et O.), France.

FROST, Paul Davis, B.Met.Eng., Chief, Light Metals Division, Battelle Memorial Institute, 505 King Avenue, Columbus 1, Ohio, U.S.A.

GALLISTL, Erich, Dipl.Ing., Dr.techn., Metallurgist, Georg Fischer A.G., Schaffhausen, Switzerland.

GERSDORFER, Otto Heinrich, Dipl.-Ing., Dr.techn., Oberingenieur, Leiter der Technischen Entwicklungsabteilung, Caro-Werk G.m.b.H., Lützowgasse 12–14, Wien 14, Austria.

GIBBINS, Richard Karl, M.A., A.M.I.Mech.E., Director and Works Manager, The Birmingham Battery and Metal Co., Ltd., Selly Oak, Birmingham 29.

GIRSCHIG, *Professor* Robert Felix Henri, Ing., Lic.ès.Sc., Professeur de Statistique Mathématique, Ecole Centrale des Arts et Manufactures et à l'Institut Supérieur du Matériaux; Ingénieur Conseil, Société " Le Carbone-Lorraine ", 45 rue des Acacias, Paris (17e), France.

GUINIBERT, Arthur John, Metallographer, The Mullard Radio Valve Co., Ltd., New Road, Hackbridge, Surrey.

HINNÜBER, Josef, Dr.phil., Technischer Direktor, Fried. Krupp Widia-Fabrik, Essen, Germany.

KOBAYASHI, Tojiro, Dr.Eng., Chief, Engineering Department, The Nippon Aluminium Manufacturing Co., Ltd., 472 Miyahara-Cho, Higashiyodogawa-ku, Osaka, Japan.

KORITTA, Josef, Ing.Dr., Reditel výzkumného ústavu, Výzkumny ustav materiálu a technologie, Opletalova 25, Praha 3, Czechoslovakia.

LÖGDÖ, John Henrik, Bergsing., Verkställande direktör, Svenska Metallverkens Ugns AB, Västeras, Sweden.

PHIPPS, Robert Farley, Galvanizing Department Superintendent, Henry Hope and Sons, Ltd., Woden Road West, Wednesbury, Staffs.

PLAT, Maurice Léon Louis, Ing., General Works Manager, E. and E. Kaye, Ltd., Queensway, Ponders End, Middx.

ROBBINS, Rodway Albert, Experimental Officer, British Insulated Callender's Cables, Ltd., Research Organization, Wood Lane, London, W.12.

ROWLAND, Peter Reginald, Ph.D., M.Sc., Senior Research Physicist, A.M.P. (Great Britain), Ltd., 60 Kingly Street, Regent Street, London, W.1.

SCHINN, Rudolf, Dipl.-Ing., Chef, Materialprüfungsanstalt, Siemens-Schuckertwerke A.G., Mülheimer Werk, Engelbertusstrasse 110, Mülheim-Ruhr, Germany.

SMITH, Douglas Powell, Chief Chemist and Metallurgist, The Aeroplane and Motor Aluminium Castings, Ltd., Wood Lane, Erdington, Birmingham 23.

SNOWDEN, Kenneth Ulmer, B.Sc., Research Officer, Broken Hill Associated Smelters Pty., Ltd., Baillieu Laboratory, University of Melbourne, Australia.

SPOONER, Dennis Alan, L.I.M., Metallurgist, S. Smith and Sons (England), Ltd., Cricklewood, London, N.W.2.

STEIN, Emil, B.Sc., A.I.M., Metallurgist, E. and E. Kaye, Ltd., Queensway, Ponders End, Middx.

STRUBL, Rudolf, Dr., Hutnický ústav ČsAV, Sokolovská 961, Praha VIII, Czechoslovakia.

TERRAZA, *Professor* José, Dr., Profesor de Metalurgia, Laboratorio de Metalurgia, Facultad de Ciencias, Universidad de Madrid, Madrid, Spain.

TRILLAT, *Professor* Jean Jacques, Ing., Doct. ès Sci., Professeur de Microscopie et Diffraction Electroniques, Université de Paris à la Sorbonne; et Directeur, Laboratoire de Rayons-X, Centre National de la Recherche Scientifique, 1 Place Aristide Briand, Bellevue (S. et O.), France.

UNDERWOOD, Sidney Edward, London Manager, Turton Brothers and Matthews, Ltd., 5 Little College Street, London, S.W.1.

WALDRON-TROWMAN, Frederic Donald, Chief Electrometallurgical Chemist, Corrosion Research Laboratories, D. Napier and Son, Ltd., 211 The Vale, Acton, London, W.3.

YAMAMOTO, Albert S., M.S., Associate Metallurgist, Armour Research Foundation, 10 West 35th Street, Chicago 16, Ill., U.S.A.

ZEIGER, Hans Gottlieb, Dipl.-Phys., Dr.rer.nat., Wissenschaftlicher Mitarbeiter, Wieland-Werke A.G., Metallwerke, Olgastrasse 147, Ulm (Donau), Germany.

As Junior Members

BORLAND, Douglas Wilson, B.Met.E., Assistant Lecturer, Department of Metallurgy, University of Melbourne, Australia.

WHITTAKER, James Abraham, B.A., Research Investigator, Fulmer Research Institute, Stoke Poges, Bucks.

As Student Members

BARKER, Richard Edward, Undergraduate, Department of Metallurgy, University of Melbourne, Australia.

BHANJDEO, Swaroop, B.Sc., Department of Metallurgy, Battersea College of Technology, London, S.W.11.

BROOKES, John Anthony, Student, Handsworth Technical College, Birmingham; Assistant Chemist, D. F. Tayler and Co., Ltd., New Hall Works, George Street Parade, Birmingham 3.

BROWN, Warwick Nicholson, Laboratory Assistant, Aeroplane and Motor Aluminium Castings, Ltd., Wood Lane, Erdington, Birmingham 23.

HARTLEY, James Fredrick Michael, " B " Flight, Royal Air Force, Bassingbourn, Herts.

HEALEY, Timothy, Student of Metallurgy, Wolverhampton and Staffordshire College of Technology; The English Electric Co., Ltd., Stafford.

PLASTOW, Byron, Undergraduate, Department of Metallurgy, University College, Swansea.

PRESTON, Christopher Thomas, Undergraduate, Department of Metallurgy, University of Manchester.

ROBERTS, Lea Frank, Undergraduate, Department of Metallurgy, University of Liverpool.

SHARP, Terence James, Student, Handsworth Technical College, Birmingham; Apprentice Metallurgist, L. H. Newton and Co., Ltd., Nechells, Birmingham 7.

STANT, John, Student, Handsworth Technical College, Birmingham; Works Analyst, Deritend Precision Castings, Ltd., Vines Lane, Droitwich Spa, Worcs.

PERSONAL NOTES

Mr. F. A. Ball, of The Mond Nickel Co., Ltd., Development and Research Department, has been awarded an Insignia in Technology by the City and Guilds of London Institute.

Mr. I. R. M. Chaston has left the General Mining and Agency Co., Ltd., and has taken a post as Research Officer with the Department of Mines, Ipoh, Malaya.

Dr. Maurice Cook was recently presented with an engraved silver cigarette box to mark the completion of 30 years' service with Imperial Chemical Industries, Ltd.

Mr. R. V. Day has left C. A. Parsons and Co., Ltd., and joined the staff of the Research Laboratories of The General Electric Co., Ltd., Wembley.

Mr. A. Dearden has recently been appointed Chief Metallurgist (Foundry), The Daimler Co., Ltd., Coventry.

Dr. R. Genders has relinquished his position as Research Director of the Coil Spring Federation Research Organization, but is retained in a consultative capacity by the Organization.

Mr. D. Gilbey has left the Ashanti Goldfields Corporation and taken up a post with Rhoanglo Mine Services, Kitwe, Northern Rhodesia.

Dr. R. Haynes has been appointed Director of Research at the new Sheffield laboratories of the Coil Spring Federation Research Organization.

Mr. A. J. Herzig, President of the Climax Molybdenum Company of Michigan, is to deliver the Sixth Gillett Memorial Lecture to the American Society for Testing Materials at its Annual Meeting in Atlantic City, N.J., on 18 June. His subject will be "A Perspective of Molybdenum-Base Alloys".

Mr. P. B. Higgins, Managing Director of Yorkshire Engineering Supplies, Ltd., has been elected President of the Association of Bronze and Brass Founders.

Mr. J. O. Hitchcock has been appointed a Director of Henry Wiggin and Co., Ltd.

Mr. D. S. Markson has left Thorn Electrical Industries, Ltd., to take up a position as metallurgist with D. Napier and Sons, Ltd., Acton.

Dr. A. Muller has been appointed Assistant to the President, Air Reduction Sales Co., New York.

Mr. D. P. C. Neave has been appointed a Director of British American Metals Co., Ltd.

Dr. R. J. Rohr has left Ipsen International, Amsterdam, and is now Technical Director of Magnus Chemical Co., Inc., Chicago, Ill.

Mr. L. R. Wilson has left Quasi-Arc, Ltd., to become Blade Division metallurgist with Garringtons, Ltd., Bromsgrove, Worcs.

OBITUARY

Mr. G. C. Mitter, O.B.E.

Mr. G. C. Mitter, one of the Corresponding Members to the Council for India, died on 10 February, 1957, as briefly announced last month.

Ganes Chandra Mitter was born in Calcutta in 1897. His early education was gained in the Howrah Government School, and then he went to St. Xavier's College, Calcutta, where he took his B.Sc. degree with first-class honours in chemistry in 1918. After obtaining his M.Sc. degree in chemistry in 1920, when he topped the list in the first class from the Calcutta University, he was awarded the Sir R. B. Ghosh (Post-Graduate) Research Scholarship in Applied Chemistry and continued his research work at the University College of Science and Technology on subjects of industrial importance, such as electrolytic oxidation of alcohol to acetic acid and the preparation of compounds of therapeutic value.

In 1922, Mr. Mitter was appointed Deputy Assay Master of the Mint and Assay Department of the Government of India, and was sent for training to the Royal Mint, London, where he worked under the guidance of Sir Thomas Rose and Dr. S. W. Smith. On his return to India, he was posted to the Bombay Mint, where he was the first Indian to hold the post of Deputy Assay Master.

From 1932 to 1947, Mr. Mitter was the Chief Assayer and Head of the Assay Department of the Government Mints at

Bombay and Calcutta. During this period, an unprecedented export of gold from India took place, and it was greatly to Mr. Mitter's credit that the assay work in connection with it was tackled so successfully and expeditiously. With the introduction of quaternary alloy (silver 50, copper 40, nickel 5, zinc 5%) coinage in 1939, the metallurgical control and assay of it was vested in the Assay Offices under Mr. Mitter's charge, and the very large coinage programme that was carried out during the war years was executed smoothly and without any technical trouble whatsoever. Mr. Mitter officiated as Mint Master, Bombay, on more than one occasion.

During the period 1947–52, Mr. Mitter, now Chief Technical Adviser, Ministry of Finance, Government of India, was given the important task of planning a silver refinery capable of recovering silver from the quarternary alloy coins, so that 225 million ounces of Lend-Lease silver could be returned to the United States.

In 1952, Mr. Mitter was appointed Master, Assay Department and Silver Refinery Project, a post he held until his death. In this capacity he was entrusted by the Government of India with the setting up of a silver refinery operating a new process, of which he was the joint inventor. Mr. Mitter also had several patents to his credit in connection with his work on refining non-ferrous metals carried out under the auspices of the Council of Scientific and Industrial Research, India.

For over a decade Mr. Mitter was actively connected with

several committees of the Government of India dealing with the Government's research and development programme. He was Honorary Professor in the (Royal) Institute of Sciences, Bombay, for more than one term and served as a member of the Advisory Committees of the National Institute of Sciences, Victoria Jubilee Technical Institute, Bombay, and the Royal Institute of Chemistry, London. He was a Fellow of the National Institute of Sciences in India and of the Royal Institute of Chemistry, and was a member of many scientific societies both in India and abroad. He joined the Institute of Metals in 1922 and was appointed a Corresponding Member to the Council for India in 1955.

Mr. Mitter took an active part in the initial stages of the foundation of the Indian Institute of Metals, and directed its policies as a Member of Council from 1947 to 1954. He served as a Vice-President of the Institute from 1951 to 1953, and was elected President in 1954. Mr. Mitter was also actively connected with the Bombay Metallurgical Society, of which he was President in 1949–50.

Mr. Mitter was widely travelled, and had been to the U.S.A., Great Britain, and West Germany as a member of Government deputations. In private as well as in social life, he endeared himself to all by his informality and his amiable disposition.

D. P. ANTIA.

LETTER TO THE EDITOR

Internal Friction of Aluminium–Magnesium–Zinc Alloys

A low-temperature, low-internal-friction peak has been observed in aluminium–magnesium–zinc alloys. An alloy of

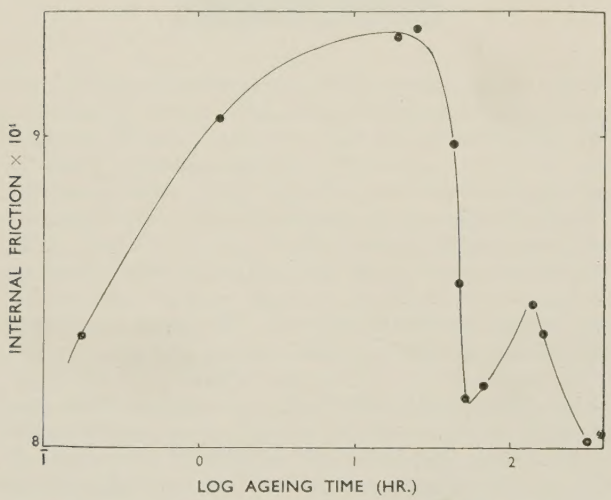

FIG. 1.—Variation of the Internal Friction of R.R. 77 Alloy on Ageing at Room Temperature after Quenching. Frequency = 0·337 cycles/sec.

commercial purity (R.R. 77 of composition: Mg 2·0–3·5, Zn 4·5–6·5, Cu 1·5 max., Mn 1 max., Fe, Si, Cr 0·5 max. each, Ti 0·3% max., Al remainder) was drawn into wire 0·027 in. in dia. and tested in a torsional pendulum at a low frequency and at amplitudes giving a maximum shear strain of 10^{-4}. The wire was first solution-treated at 470° C. for 2 hr. quenched, and then tested at room temperature after various ageing times. The results are shown in Fig. 1. The hardness on another sample of the same material reached a maximum after about 430 hr. In other words, the phenomenon causing the internal friction reached maximum intensity long before the hardness did. The activation energy of the ageing process was

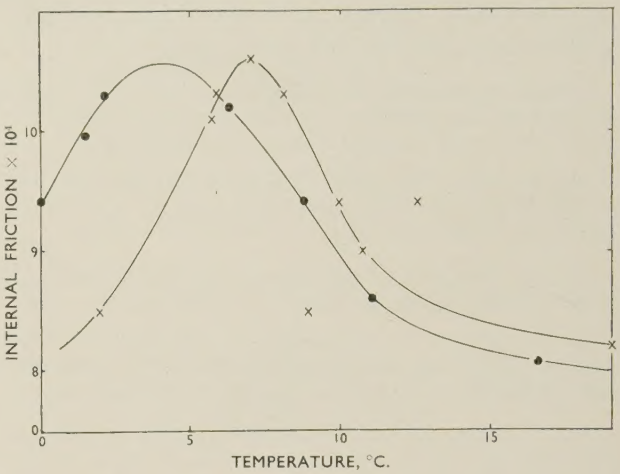

FIG. 2.—Variation of the Internal Friction of R.R. 77 Alloy with Testing Temperature. Frequency: • = 0·337 cycles/sec.; × = 0·575 cycles/sec.

derived from hardness/time curves at temperatures ranging from 17° to 165° C. A value of 11,500 cal./mole was obtained. After 144 hours' ageing, the internal friction was determined as a function of testing temperature (Fig. 2). A similar maximum was found when an alloy of similar composition, but containing only aluminium, magnesium, and zinc, was tested.

The peaks are reminiscent of those obtained by Entwistle [1] for aged aluminium–copper alloys. No explanation or discussion is offered here, since the possible sources of such a peak have already been very fully discussed by Entwistle. The results are published in the hope that an explanation may be suggested.

Thanks are due to Mr. T. O'Callaghan for some of the results given here.

R. RAWLINGS

Department of Metallurgy and Fuel Technology,
University College,
Cardiff.

REFERENCE

1. K. M. Entwistle, *J. Inst. Metals*, 1953–54, **82**, 249.

NEWS OF ASSOCIATED SOCIETIES

Australian Institute of Metals

The Tenth Annual Conference of the Australian Institute of Metals was held in Sydney, N.S.W., from 20 to 24 May. The Conference was officially opened on the evening of 20 May by the Hon. Howard Beale, Minister for Supply and for Defence Production. On the following days there was an

interesting programme of works visits and technical discussions, including a symposium on " Atmosphere Control in Heat-Treatment Furnaces ". The Presidential Address, by Dr. H. K. Worner, dealt with metallurgical research in Australia, and the A.I.M. Annual Lecture was delivered by Dr. Maurice Cook, Chairman of Imperial Chemical Industries, Ltd., Metals Division.

OTHER NEWS

Symposium on High-Vacuum Technology

The Fourth Annual Symposium on High-Vacuum Technology will be held in Boston, Massachusetts, on 9, 10, and 11 October 1957, at the Hotel Somerset. The meeting is sponsored by the Committee on Vacuum Techniques, who expect it to be attended by operating people, design and process engineers, and research men whose duties involve the use of high vacuum.

High vacuum—long a recognized laboratory processing technique—has gained broad acceptance as an industrial processing tool since World War II, on account of its use in melting and casting metals, in exhausting electron tubes, in applying decorative finishes, in impregnating electrical devices, and in leak-testing all types of containers which must be gas- or liquid-tight.

The Committee on Vacuum Techniques has been formed as a non-profit-making corporation to assist in the dissemination of information on vacuum techniques, processes, and new developments in equipment to academic, government, and industrial organizations.

The Committee on Vacuum Techniques is soliciting proposals for papers to be presented at the Boston meeting. Authors who could offer papers dealing with methods of producing and measuring vacuum, new processes using vacuum, fundamental developments in vacuum technology, or the use of vacuum in research are invited to write to the Committee on Vacuum Techniques, P.O. Box 1282, Boston 9, Mass., U.S.A.

APPOINTMENTS VACANT

UNIVERSITY OF BIRMINGHAM

Applications are invited for two Grade II Lectureships in the Department of Industrial Metallurgy. Candidates should have a suitable degree and industrial or research experience with an interest in the application of scientific principles in industrial metallurgy. The persons appointed will lecture to final-year and postgraduate students of metallurgy. The Department offers good facilities for research. Salary within the range £650–£1350 p.a. before 1 August 1957, and £900–£1650 after 1 August 1957.

Applications (two copies), with the names of three referees, should be sent as soon as possible to the Registrar, The University, Birmingham 15, from whom further particulars may be obtained.

Imperial Chemical Industries Limited
Billingham Division

Vacancies for

METALLURGISTS

There are vacancies for Assistant Technical Officers in our division metallurgical laboratories. These appointments offer interesting work in many fields of metallurgy, ranging from long-term research to the diagnosis of metal equipment failures.

Appointments are permanent and pensionable and there is a Profit-Sharing Scheme in operation. Assistance can be given towards house purchase and removal expenses in the case of married men.

Applications are invited from men up to about 30 years of age who hold a Higher National Certificate, L.I.M., or a degree in metallurgy. Some experience in industry is desirable, but applicants who have just completed an academic qualification can be considered.

Write, giving brief details of age, qualifications, and experience, to the Staff Manager, Imperial Chemical Industries, Ltd., Billingham Division, Billingham, Co. Durham, quoting reference W/N/4.

WELDING RESEARCH

A metallurgist is required at the Birmingham Laboratory of The Mond Nickel Company, Ltd., to conduct research on the welding and brazing of heat- and corrosion-resistant nickel-base alloys, stainless steels, and cast irons. Previous research experience in welding or brazing is preferred, but is not essential. Publication of results is encouraged.

Salary will be in accordance with experience and qualifications. Pension and insurance schemes are in operation and, in appropriate cases, assistance can be given with housing. Applications, which will be treated in confidence, should give details of age, qualifications, and experience and be addressed to The Manager, Development and Research Department, The Mond Nickel Co., Ltd., Thames House, Millbank, London, S.W.1. Mark envelope " Confidential L.44 ".

APPOINTMENT WANTED

RESEARCH METALLURGIST, M.A.(Oxon), British citizen, at present resident (4 years) in California, U.S.A., seeks permanent liaison position as representative of British or Dominion organization, preferably in Western U.S.A. 17 Years' varied experience in high-temperature materials, titanium, creep and fatigue, and lubrication research in U.K. and U.S.A., in industrial, university, and Civil Service posts. Box No. 431, Institute of Metals, 17 Belgrave Square, London, S.W.1.

THE FOUNDATIONS OF METALLOGRAPHY

By

Professor GEORG MASING (*Göttingen*)

Translated by

Professor F. C. THOMPSON (*Manchester*)

An authorized translation of the fourth edition (1955) of " Grundlagen der Metallkunde in anschaulicher Darstellung " (Springer-Verlag).

Professor Thompson, in a preface he has contributed to the English edition, writes : " There is abundant evidence that ' The Foundations of Metallography ' has been written by a teacher of outstanding experience, with equal sympathy both for the theoretical and for the more practical points of view, and any reader who has conscientiously worked through this material cannot fail to have acquired a basic understanding of metallographic principles, on which foundation a sound superstructure can be built."

Believing that there is no comparable book in the English language, the Institute is placing this translation on the market at the lowest price possible under present-day conditions, in the hope that it will prove valuable to a great number of university and technical college students in English-speaking countries.

Demy 8vo. Cloth bound. 166 pages, with 140 illustrations
Price (post free) 21s. or $3.50 ; Libraries 17s. 6d. ($2.90)
Members (one copy each) 10s. 6d. ($2.00)

THE INSTITUTE OF METALS : 17 Belgrave Square, London, S.W.1

THE FINAL FORMING AND SHAPING OF WROUGHT NON-FERROUS METALS

Cloth. 4to. 128 pages, with 15 plates and numerous line figures in the text.
Price 21s. or $3.50, post free; Members one copy at 10s. 6d. or $2.00, post free.

CONTENTS

The Machining Properties of Non-Ferrous Metals.
By D. F. Galloway, Ph.D., Wh.Sch., M.I.Mech.E., M.I.Prod.E., M.I.I.A., A.M.I.E.E., B.Sc.Hons., M.Inst.Pet. (*Production Engineering Research Association*)

The Deep Drawing and Spinning of Sheet Metal, with Particular Reference to Non-Ferrous Materials.
By John A. Grainger, A.M.I.Mech.E., A.M.I.Prod.E., A.M.I.I.A. (*Rolls Royce, Ltd.*)

Rubber Pressing.
By J. Fielding, A.M.I.Mech.E., Assoc.M.C.T.(Met.) (*A. V. Roe and Co., Ltd.*)

Research into Some Metal-Forming and Shaping Operations.
By W. Johnson, B.Sc.Tech., B.Sc., A.M.I.Mech.E. (*Department of Mechanical Engineering, University of Sheffield*)

Cold Roll-Forming and Manipulation of Light-Gauge Sections.
By E. Griffin, A.M.I.Mech.E., A.M.I.Prod.E. (*Metal Sections, Ltd.*)

Stretch-Forming of Non-Ferrous Metals.
By R. D. Edwards, A.M.I.Mech.E. (*Vickers-Armstrongs (Aircraft), Ltd.*)

Bending and Allied Forming Operations.
By T. G. Perry, B.A., S.M. (*The A.P.V. Co., Ltd.*)

The Hot Forming of Magnesium Alloys.
By R. G. Wilkinson, B.Sc. (*Magnesium Elektron, Ltd.*)

General Discussion.

INSTITUTE OF METALS · 17 Belgrave Square, London, S.W.1